



Homework 5 Problem recognition

1. In the film "The Imitation Game", the code breakers tried different approaches to cracking the German code, a transposition cipher in which each letter of the alphabet was replaced by another letter.
 - (a) Using a "brute force" method, how many different permutations of letters would they need to try, in the worst case scenario? Leave your answer in the form of a factorial.
(e.g. $4! = 4 \times 3 \times 2 \times 1$) [1]
 - (b) Describe another strategy that could be tried rather than a brute force method to crack the code. [3]

2. (a) There are three children whose first names are Anne, Brian and Mary. Their surnames are Brown, Green and White, but not necessarily in that order. Given the following two clues, find each child's full name and age. [3]

Tip: Use the grid to help you. Place an *x* in each box which you know to be wrong, and a *✓* in each box that you know to be right.

Clues

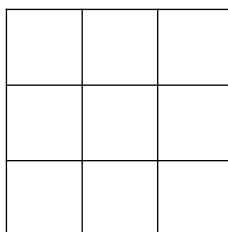
1. Miss Brown is three years older than Mary.
2. The child whose surname is White is 9 years old.

	Brown	Green	White	7	9	10
Anne						
Brian						
Mary						
7						
9						
10						

- (b) Write down **two** logical decision statements that helped you to find a solution. [2]



3. (a) Describe briefly an example of a “Divide and Conquer” algorithm. [2]
- (b) State any preconditions for devising the solution to this algorithm [1]
- (c) Why is this problem solving strategy generally so much more effective than a “brute force” method of solving the problem? [1]
- (d) Give **two** circumstances when a brute force method may be preferable to a “divide and conquer” algorithm. [2]
4. A magic square with 3 rows and 3 columns is one which is filled with distinct integers 1-9 so that the sum of the numbers in each row, column and corner-to-corner diagonal are the same. (*Tip: The middle number is 5.*)



- (a) Using a brute force method, you would need to try up to 362,880 different combinations of numbers. How is this number arrived at? [1]
- (b) Use another method to solve the problem. [2]
- (c) Describe your strategy. [2]



[20 marks]